



DEPARTMENT OF ACADEMIC UPGRADING

COURSE OUTLINE – WINTER 2015

Mathematics Grade 12 Calculus Equivalent

INSTRUCTOR: Sukhvir Sandhu **PHONE:** (780) 539-2810 or 2234

OFFICE: Math Lab A210 **E-MAIL:** ssandhu@gprc.ab.ca

OFFICE HOURS: Daily, 8:00 – 8:30 am and 11:00 – 11:45 am in the Math Lab

PREREQUISITE(S)/COREQUISITE:

MA0120 or equivalent (Pre- or Co-requisite MA0130)

MA20-1 or equivalent (Pre- or Co-requisite MA30-1)

REQUIRED TEXT/RESOURCE MATERIALS:

Package of MA0131 modules, 2007

Scientific calculator, graphing paper

CALENDAR DESCRIPTION:

This course includes slopes and tangents, distance, velocity and acceleration, maxima and minima, sequences, limits and derivatives, derivatives of functions, tangents, derivatives and graphs, further applications of derivatives and anti-derivatives.

CREDIT/CONTACT HOURS:

MA0131 Mathematics Grade 12 Calculus Equivalent 5 (5-0-0)

Time: 75 Hours

DELIVERY MODE:

MA0131 is a modularized math course divided into 9 separate units called modules. The instructions for each topic are given in the modules, followed by several examples and exercises. Study the instructions and work through the examples before starting each exercise. The answers for each exercise are given at the end of the module. Check your work to make sure you understand each new topic. The key to success in working with modules is to ask questions whenever you have difficulty understanding the instructions, the examples, or the exercises. **Do not hesitate to ask for help.**

After each module you must write a test. When writing a test, be sure to show all of your work on the test paper. Marks are given for method as well as final answer. A passing mark of 50% is required on the test before continuing on to the next module. If you are unable to attain this mark, you must review the material and rewrite the test. The first and second test marks will be averaged.

A 50-minute midterm, which will cover the first four modules, must be written by **Thursday, February 26**. If you miss this date, you will receive a mark of 0% on your midterm. Upon completion of all the course modules, you will write a three hour final exam. Be sure to leave time to prepare for these important exams! They are worth a large percentage of your final grade.

The recommended test date for each module and the midterm is on the back of the next page. Follow these dates as closely as you can. You are encouraged to write a test early if you are prepared. **Consult your instructor immediately if you find yourself falling behind schedule.** Your instructor may need to reassess your math skills to ensure that you are placed in a course where you can be successful. **All tests must be written by Tuesday, April 14.**

Bonus

When you write your module tests on or before the given date, you will be awarded an additional 2% on your score for each test.

LEARNING OUTCOMES

1. Review

Draw graphs of functions by applying transformations to the graphs of known functions.
Factor expressions with integral and rational exponents, using a variety of techniques.
Rationalize expressions containing a numerator or a denominator that contains a radical.
Simplify rational expressions, using any of the four basic operations.

2. Limits

Determine the limit of a sequence as the independent variable approaches infinity.
Calculate the sum of an infinite convergent geometric series.
Determine left and right-hand limits.
Determine the limit of a function for a given value using the graph of the function.
Determine the limit of any algebraic function as the independent variable approaches finite or infinite values for continuous and discontinuous functions.
Compute limits of functions, using definitions and limit theorems.
Determine whether a function is continuous or discontinuous.

3. The Derivative

Estimate the numerical value of the derivative of a polynomial function at a point, using a sequence of secant lines.
Determine the derivative of a function from first principles (definition of a derivative).
Determine the slopes and equations of tangent lines and the normal at given points on a curve, using the definition of a derivative.
Use the definition of a derivative to determine the derivative of $f(x) = x^n$ where n is a positive integer.
Differentiate functions of the form $f(x) = cx^n$ where c is a constant.
Differentiate functions that are single terms of the form x^n where n is rational.
Differentiate polynomial functions, using the derivative theorems for sum and difference.
Find a derivative to determine a rate.

4. More Derivatives

Use the chain rule to determine the derivative of a polynomial power.
Find the derivative of a product or quotient function.
Apply the chain rule in combination with the product and quotient rule to determine a derivative.
Simplify a differentiated answer using factoring skills.
Differentiate a function using implicit differentiation.
Determine the value of the derivative at a given point.
Determine the slope and equation of the tangent at a given point.
Determine the second derivative of a function.

5. Curve Sketching

Relate the zeros of the derivative function to the critical points on the original curve.

Sketch the graph of a function using first and second derivatives to find maxima, minima and inflection points.

Determine asymptotes, and domain and range of a function.

Determine intervals where the derivative is greater than zero or less than zero in order to predict where the function is increasing or decreasing.

Determine intervals where the second derivative is greater than zero or less than zero in order to predict whether the curve is concave up or concave down.

Determine whether or not a critical point is a maximum or a minimum.

6. Applications: Maximum/Minimum

Use derivatives to determine maximum or minimum values for applications involving numbers, geometry, distance and time, economics, and science.

7. Applications: Rate of Change

Determine instantaneous velocity and acceleration by finding the first and second derivatives of a position function.

Use derivatives to solve rate of change applications relating to science, area and volume, and related motion.

8. Anti-Derivatives and Area

Find the antiderivatives of polynomial, radical, and rational functions.

Determine the family of curves whose first derivative has been given.

Solve first order differential equations for general and specific solutions.

Determine the area between a curve and the x-axis over a given interval.

Determine velocity and displacement by finding the antiderivatives of acceleration and velocity functions.

9. Derivatives of Trigonometric Functions

Determine the limit for a trigonometric function as the angle approaches a finite or infinite value.

Determine the derivative of the sine function from first principles.

Determine the derivative of the three primary and three reciprocal trigonometric functions.

Find the derivative of more complicated trigonometric functions using the power, chain, product and quotient rules.

TRANSFERABILITY:

This course is listed in the Alberta Transfer Guide. It is accepted at colleges and universities in Alberta as equivalent to Math 31.

GRADING CRITERIA:

GRANDE PRAIRIE REGIONAL COLLEGE			
GRADING CONVERSION CHART			
Alpha Grade	4-point Equivalent	Percentage Guidelines	Designation
A⁺	4.0	90 – 100	EXCELLENT
A	4.0	85 – 89	
A⁻	3.7	80 – 84	FIRST CLASS STANDING
B⁺	3.3	77 – 79	
B	3.0	73 – 76	GOOD
B⁻	2.7	70 – 72	
C⁺	2.3	67 – 69	SATISFACTORY
C	2.0	63 – 66	
C⁻	1.7	60 – 62	
D⁺	1.3	55 – 59	MINIMAL PASS
D	1.0	50 – 54	
F	0.0	0 – 49	FAIL
WF	0.0	0	FAIL, withdrawal after the deadline

Your final mark is determined by:

9 module tests	45%
Midterm	15%
Final Exam	40%

STUDENT RESPONSIBILITIES:

In addition to the *Student Rights and Responsibilities* as set out in the college website, the following guidelines will maintain an effective learning environment for everyone:

1. Regular attendance is expected of all students in all mathematics courses. Your success in math is directly linked to your attendance. Attendance will be taken daily.
2. Students are expected to be punctual. Arrive on time for classes and remain for the duration of scheduled classes.
3. Refrain from disruptive talking or socializing during class time.
4. Be respectful of others regarding food or beverages in the classroom. Clean up your eating area and dispose of garbage.
5. Recycle paper, bottles, and cans in the appropriate containers.
6. Children are not permitted in the classrooms.
7. Students are expected to notify the instructor of any extenuating circumstances.

ELECTRONIC DEVICES:

Students are expected to turn off cell phones during class time or in labs. No unspecified electronic devices will be allowed in exams.

STATEMENT OF PLAGIARISM:

Please refer to the College Website for policies regarding plagiarism and cheating as well as the resultant penalties. These are serious issues and will be dealt with severely.

STUDENT PRINTING POLICY:

Please refer to the College website (Home > Admissions > Tui for printing policy which limits the free use of papers, and extra charges are required if the limit is used up.

MA0131 Winter 2015
MA0131 TESTS / EXAMS

Module	TOPIC/DESCRIPTION	Recommended Time & Test Date	Date written	Your mark
1	Review	6 days Wednesday, January 14		
2	Limits	7 days Friday, January 23		
3	The Derivative	8 days Wednesday, February 4		
4	More Derivatives	9 days Tuesday, February 24		
	MIDTERM - must be written on or before	Thursday, February 26		
5	Curve Sketching	4 days Wednesday, March 4		
6	Applications: Maximum/Minimum	6 days Thursday, March 12		
7	Applications: Rate of Change	7 days Monday, March 23		
8	Anti-derivatives and Area	9 days Monday April 6		
9	Derivatives of Trigonometric Functions	6 days Tuesday April 14		
	FINAL EXAM - 3 HOURS	To be announced April 16 - 27		

MA0131 Winter 2015 Homework Schedule

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|---------------------|----------------|-------------|---------------|-----------|-----------|---------------|---------------------------------|
| 1. Review | 1 | 2 | 3 | 4 | 5 | | |
| | Jan. 7 | 8 | 9 | 12 | 13 | | Test: Wednesday, Jan. 14 |
| | | | | | | | |
| 2. Limits | 1 | 2 | 3 | 4 | 5 | Review | |
| | Jan. 15 | 16 | 19 | 20 | 21 | 22 | Test: Friday, Jan. 23 |
| | | | | | | | |
| 3. The Derivative | 1 | 2 | 3 | 4 | 5 | 6 | Review |
| | Jan. 26 | 27 | 28 | 29 | 30 | Feb. 2 | 3 |
| | | | | | | | |
| 4. More Derivatives | 1 | 2 | 3 | 4 | 5 | Review | |
| | Feb. 5 | 6, 9 | 10, 11 | 12 | 13 | 23 | Test: Tuesday, Feb. 24 |

Midterm Exam on Thursday, February 26

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|---|----------------|---------------|-----------|-----------|-----------|-----------|--------------------------------|
| 5. Curve Sketching | 1 | 2 | Review | | | | |
| | Feb. 27 | Mar. 2 | 3 | | | | Test: Weds, Mar. 4 |
| | | | | | | | |
| 6. Applications: Maximum/Minimum | 1 | 2 | 3 | 4 | Review | | |
| | Mar. 5 | 6 | 9 | 10 | 11 | | Test: Thursday, Mar. 12 |
| | | | | | | | |
| 7. Applications: Rate of Change | 1 | 2 | 3 | 4 | 5 | Review | |
| | Mar. 13 | 16 | 17 | 18 | 19 | 20 | Test: Monday, Mar. 23 |
| | | | | | | | |
| 8. Anti-derivatives and Area | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | Mar. 24 | 25 | 26 | 27 | 30 | 31 | Apr 1 |
| | | | | | | | Rev
2 |
| | | | | | | | Test: Monday, Apr. 6 |
| | | | | | | | |
| 9. Derivatives of Trigonometric Functions | 1 | 2 | 3 | 4 | 5 | Review | |
| | Apr. 6 | 7 | 8 | 9 | 10 | 13 | Test: Tuesday, Apr. 14 |

Final exam to be announced (April 16 - 27)